SOIL MESOFAUNA OF SECONDARY SUCCESSION SERES PRECEDING OAK FOREST IN THE SOUTHERN MOSCOW AREA

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ПОЧВЕННАЯ МЕЗОФАУНА ВТОРИЧНЫХ СУКЦЕССИОННЫХ РЯДОВ, ПРЕДШЕСТВУЮЩИХ ДУБРАВАМ ЮЖНОГО ПОДМОСКОВЬЯ

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In 1977 and 1979, in the Priokslko-Terrasny Reserve in the southern of Moscow Region, a comparative study was conducted on soil mesofauna in the plant associations on the sandy soils substituting a former oak stand.

With recovery of the oak stands upon clear-cutting and fires, succession seres are initially independent and subsequently merge into a similar association sere to finally become an oak stand. The clear-cutting sere begins

with: (1) Association Anthoxanthum odoratum; (2) Betula verrucosa - Luzula pilosa. The post-fire sere begins with: (3) Betula verrucosa - Calamagrostis arundinacea; (4) Picea excelsa - Vaccinium myrtillus; (5) Picea excelsa - Carex digitata. The resulting seres are: (6) Picea excelsa - Oxalis acetosella; (7) Picea excelsa - Carex pilosa; (8) Quercus robur - Corylus avellana - Carex pilosa.

The secondary seres differ from primary seres in a more rapid rate of recovery of the original vegetation not being accompanied by any sharp changes in moisture or morphology of the soil profile. Throughout the entire sere of plant associations under study soddy podzolic or soddy-weakly-podzolic soil are developing.

The similarity of ecological conditions of soil formations in all the associations under study determines the similarity of many characteristics of the soil population: numbers, species composition, composition of dominant species, trophic structure. The difference in numbers between all the communities concerned was no more than 1.5-fol: in the excision sere the numbers vary from 380 (Assoc. 1) to 450 ind/m^2 (Assoc. 2 and 6); in the pyrogenic, lengthier seres, the numbers fluctuated in a wider range - from 400 (Assoc. 8) to 630 ind./m^2 (Assoc. 5).

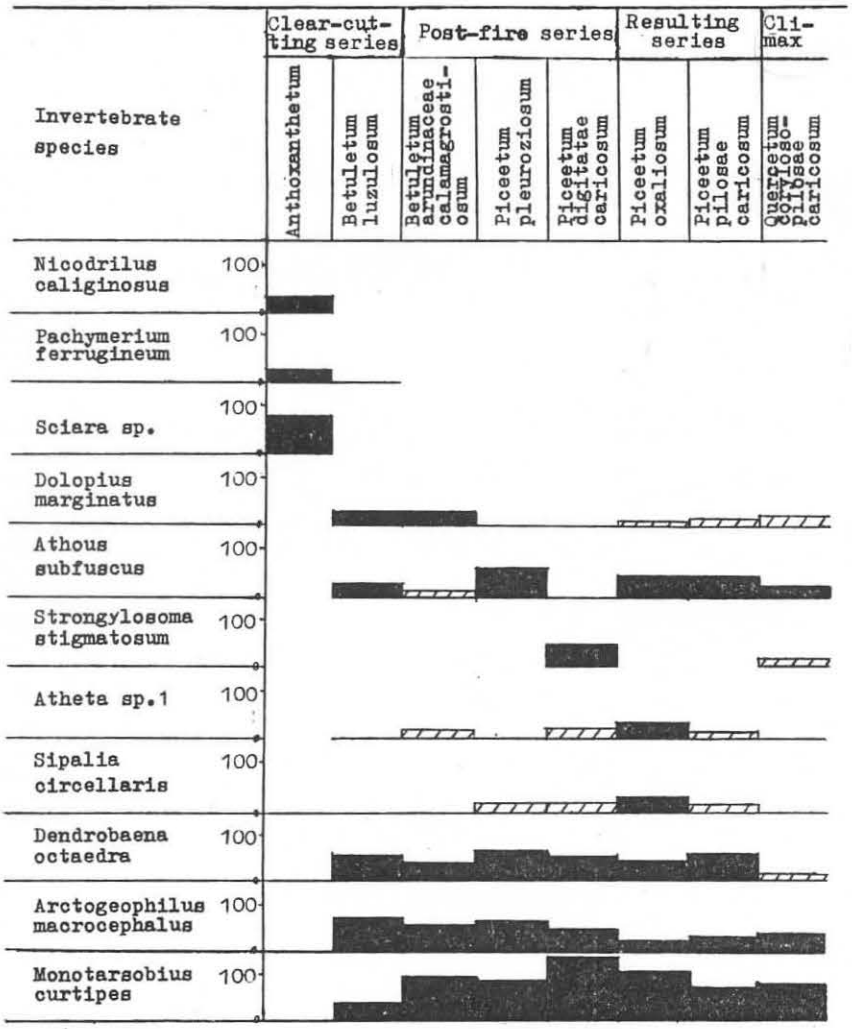
The fluctuations of overall biomass in the sere concerned were greater. The highest and fairly close biomass levels were found in the pioneer associations - in the meadow (17.2 g/m^2) one and in the Betuletum calamagrostiosum (14.2 g/m^2), and the lowest, in the Piceetum pleurozіosum and Piceetum oxaliosum respectively 7.0 g/m^2 and 5 g/m^2. In the Betuletum luzulosum and in both Piceeta caricosa biomass levels were intermediate, respectively 8 and 8.5 g/m^2. This pattern of changes in the overall mesofauna biomass correlate with changes of some related soil indices, the pH value, the degree of soddying process, the content of humus in the soil and C:N ratio in the litter.

In summer, the animal population of most habitats was concentrated in the litter (from 70 to 80% of the total number) and only in the meadow the majority of the population (58%) was not found in the litter but in the turf layer.

The species composition of invertebrates for the entire range of associations was fairly homogenous. The greatest specificity and diversity (99 species per 16 samples) were recorded in the meadow association. The bulk of the species was dwellers of open habitats: Pachymerium ferrugineum, Harpalus latus, Xantholinus linearis. In contrast to the other associations, the most numberful earthworm species was found to be Nicodrilus caliginosus, which was not recorded by us in other habitats under study on sandy soils. Numerous polytopic forest species were already found in the pioneer meadow association, e.g. Dendrobaena octaedra, Monotarsobius curtipes, Arctogeophilus macrocephalus.

The forest associations of both seres, retain the bulk of forest invertebrate species, which accounts for the high level of similarity of soil mesofauna communities in them. Numerous forest species are close in numbers in all or in several associations of the sere (Table 1). It is important to emphasize the presence of a number of species specific only for the initial

Abundance of mass invertebrates species in different series of associations. Black - dominants, shaded - subdominants, line - rare species, ex./m^2



(meadow - birch stands) and climax (oak stand) succession stages, e.g. Eisenia nordenskioldi, Lumbricus rubellus, Selatosomus aeneus.

The greatest similarity in the composition of invertebrate complexes was recorded between the plots with developed herbaceous cover (Betuleta - Piceeta caricosa - Quercetum). These associations also showed numerous peculiarities in soil indices - the reaction of the environment was weakly acid, the C:N ratio in the litter was relatively low. Here the saprophage fauna was far more diversified, with 1 litter species, 2-3 litter-soil earthworm

species, 2-3 diplopod species, 2 species of tipulid larvae and one bibionid larva species.

In the Piceeta pleuroziosum and oxaliosum with well-developed podzolization process and thick litter, the invertebrate population composition somewhat differed from the above group of associations: the entire fauna, and notably, the saprophages were poorer taxonomically. Earthworms were represented by a small-sized species Dendrobaena octaedra, Diplopoda, also by a single species characteristic of coniferous forests - Polyzonium germanicum. The latter species, and also the larvae of Tipulidae and Bibionidae occured only individually.

Thus, the pattern of changes in mesofauna groups in the seres of recovered oak stand was wave-like. The greatest similarity was shown between associations separated by a single or two stages rather than by the closest succession stages.

All the association showed a well-marked correspondence between the abundance and diversity of saprophages and development of a definitive humus type.

In the meadow association, the mass of saprophages was the highest (13.3 g/m^2), and their diversity was also high - 3 earthworm species, 2 diplopod species, sciarid larvae, etc. In contrast to other communities, half of the biomass of soil invertebrates was accounted for by detritophages (Nicodrilus caliginosus), and only one fourth, by primary leaffall decomposers. Over 85% of saprophages were species pertaining to humificators. Here, a root mull type of humus was being formed close to mull - it was characterized by a thun felt-like litter (1 cm) and a well-developed humic horizon (18-22 cm).

In all forest associations, the mass of saprophages was lower than on the meadow. In terms of mass, the saprophage population was dominated by primary decomposers i.e. litter and litter-soil earthworms, Diplopoda, tipulid and bibionid larvae. In hardwood forests their contribution was higher (72%) than in coniferous ones (62%).

The acid soil of the Piceeta oxaliosa and pleuroziosa was largely favourable for a single saprophage species (the small litter earthworm Dendrobaena octaedra). A large proportion of the population was constituted by a mixed feeding group represented by elaterid larvae - Athous subfuscus and Dolopius marginatus, characteristic of thick acid litters. The overall mass of saprophages in the Piceeta of this type was not high (3.1-5 g/m^2). In both associations, a duff mull humic type was being developed, characterized by a fairly thick (4 cm), semi-decomposed litter and a shallow humic horizon of 7-10 cm.

The hardwood associations showed a mass of saprophages that was two- to three-fold higher compared with that in the Piceeta with a thick acid litter - 7 to 11.5 g/m^2. The group and species composition of saprophages there was more diversified than in the meadow and in the Piceta: with 3 to 4 species of earthworms, 2-3 species of Diplopoda, 2 species of tipulidae larvae and one species of bibionid larvae. But in contrast to the meadow association, the mass of saprophages was lower, without soil-dwelling earthworm detritophages recorded among them. In hardwood stands, a duff mull humus type was being developed, characterized by a high degree of litter decomposition, by

shallow litter (1.5-2 cm) and a fairly thick humus horizon with respect to sands (15 cm).

In Piceeta caricosa the mass (5.5 g/m^2) and diversity of saprophages were intermediate between the former type Piceeta and hardwood forests. In terms of the humus type, these soil types were transient between duff mull proper and thin duff mull.

R e f e r e n c e s

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